

VISIT...

LANZAROTE
Caliente.COM

Telling Time



PATRICIA J.
MURPHY

A Note to Parents

DK READERS is a compelling program for beginning readers, designed in conjunction with leading literacy experts, including Dr. Linda Gambrell, Professor of Education at Clemson University. Dr. Gambrell has served as President of the National Reading Conference and the College Reading Association, and has recently been elected to serve as President of the International Reading Association.

Beautiful illustrations and superb full-color photographs combine with engaging, easy-to-read stories to offer a fresh approach to each subject in the series. Each DK READER is guaranteed to capture a child's interest while developing his or her reading skills, general knowledge, and love of reading.

The five levels of DK READERS are aimed at different reading abilities, enabling you to choose the books that are exactly right for your child:

- Pre-level 1:** Learning to read
- Level 1:** Beginning to read
- Level 2:** Beginning to read alone
- Level 3:** Reading alone
- Level 4:** Proficient readers

The “normal” age at which a child begins to read can be anywhere from three to eight years old. Adult participation through the lower levels is very helpful for providing encouragement, discussing storylines, and sounding out unfamiliar words.

No matter which level you select, you can be sure that you are helping your child learn to read, then read to learn!





LONDON, NEW YORK, MUNICH,
MELBOURNE, AND DELHI

Series Editor Deborah Lock

Art Editor Sadie Thomas

U.S. Editor John Searcy

DTP Designer Ben Hung

Production Georgina Hayworth

Picture Researcher Rob Nunn

Illustrator Peter Dennis

Reading Consultant

Linda Gambrell, Ph.D.

First American Edition, 2007

07 08 09 10 11 10 9 8 7 6 5 4 3 2 1

Published in the United States by DK Publishing
375 Hudson Street, New York, New York 10014

Copyright © 2007 Dorling Kindersley Limited

All rights reserved under International and Pan-American Copyright Conventions. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of the copyright owner.

Published in Great Britain by Dorling Kindersley Limited

DK books are available at special discounts when purchased in bulk for sales promotions, premiums, fund-raising, or educational use.

For details, contact:
DK Publishing Special Markets
375 Hudson Street
New York, New York 10014
SpecialSales@dk.com

A catalog record for this book is available
from the Library of Congress

ISBN: 978-0-7566-2948-9 (Paperback)
ISBN: 978-0-7566-2949-6 (Hardcover)

Color reproduction by Colourscan, Singapore
Printed and bound in China by L. Rex Printing Co. Ltd.

The publisher would like to thank the following for their kind permission to reproduce their photographs.

a=above, b=below, c=center, l=left, r=right, t=top.

Alamy Images: A Room With Views 6-7; Richard Levine 48br.
The Bridgeman Art Library: The Makins Collection 24. **Corbis:** 22br; Bettmann 26; Grace/zefa 4b. Hulton-Deutsch Collection 19tr; Wolfgang Kaehler 14; Markus Moellenberg/zefa 29t; Carl & Ann Purcell 21bl; Tim Thompson 3cb, 20r; Holger Winkler/zefa 5c. **DK Images:** NASA 28bl, 28cb; National Maritime Museum, London 2tr, 19tl; Natural History Museum, London 25tr; Stephen Oliver 15tl, 30cr, 49br; The Science Museum, London 15tr, 18crb. **National Institute of Standards and Technology / NIST:** Geoffrey Wheeler Photography 28tr. **Science & Society Picture Library:** Science Museum 13cr, 13cra, 13tr. **Science Photo Library:** 16tl. **SuperStock:** Maria Ferrari 16-17.

All other images © Dorling Kindersley Limited
For more information see: www.dkimages.com

Discover more at

www.dk.com





READERS



Telling Time

Written by Patricia J. Murphy



DK Publishing

Do you know what time it is?
We tell time many times a day.

*When is soccer
practice?*





What time is dinner?

*When does
the party start?*



*What time will
you get there?*



We use clocks to tell time.
They help people plan their day.
People have been telling time
for a long, long time.

Clocks from long ago did not look like ours and they did not keep the best time either.

This is the story of how clocks have changed.



Timeline



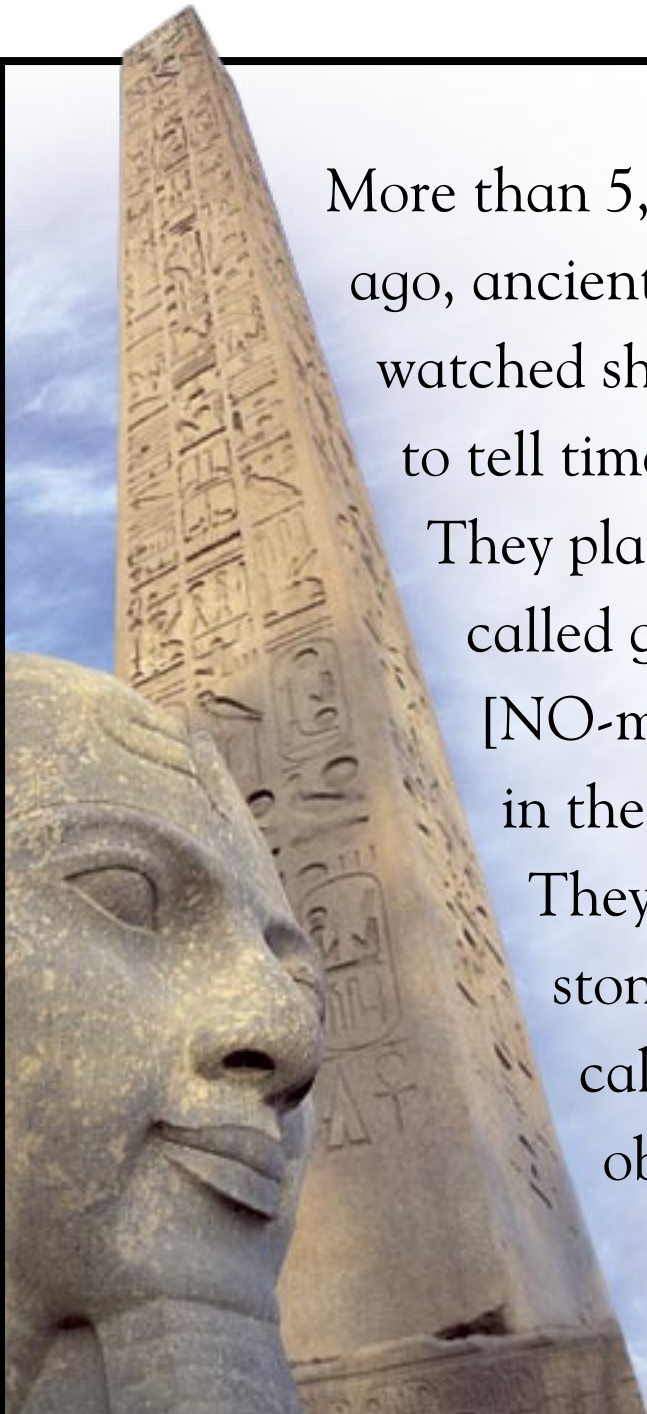
Prehistoric times

Once upon a time, people woke up
when the sun rose and went to bed
when the moon and stars came out.
These were the first clocks.

Sometimes, people used stone pillars
to mark the movement of the sun,
moon, and stars during the year.

*Stonehenge
in England*





More than 5,500 years
ago, ancient Egyptians
watched shadows
to tell time.

They placed sticks
called gnomons
[NO-muns]
in the ground.

They also built
stone pillars
called
obelisks.

Obelisk

Timeline

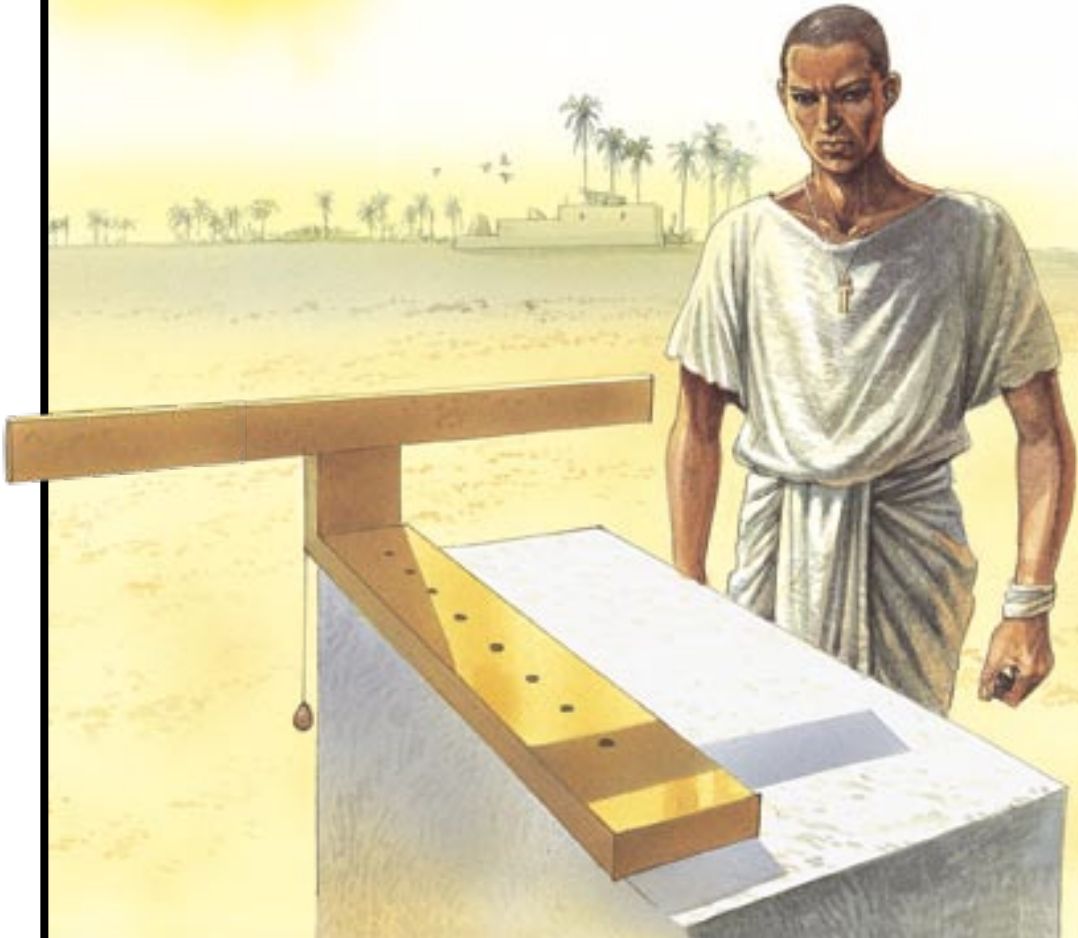


Prehistoric times 3500 BCE



These sticks and obelisks cast long shadows on the ground. As the sun moved, the direction of the shadows told people what part of the day it was. These devices were the very first sundials.

In 1500 BCE,
the Egyptians built
an even better
sundial.



It was shaped like a T and
had special markings.

The marks split the day into
ten hours of daylight and
two hours of twilight.

Like all sundials, this one could
only tell time in sunlight.

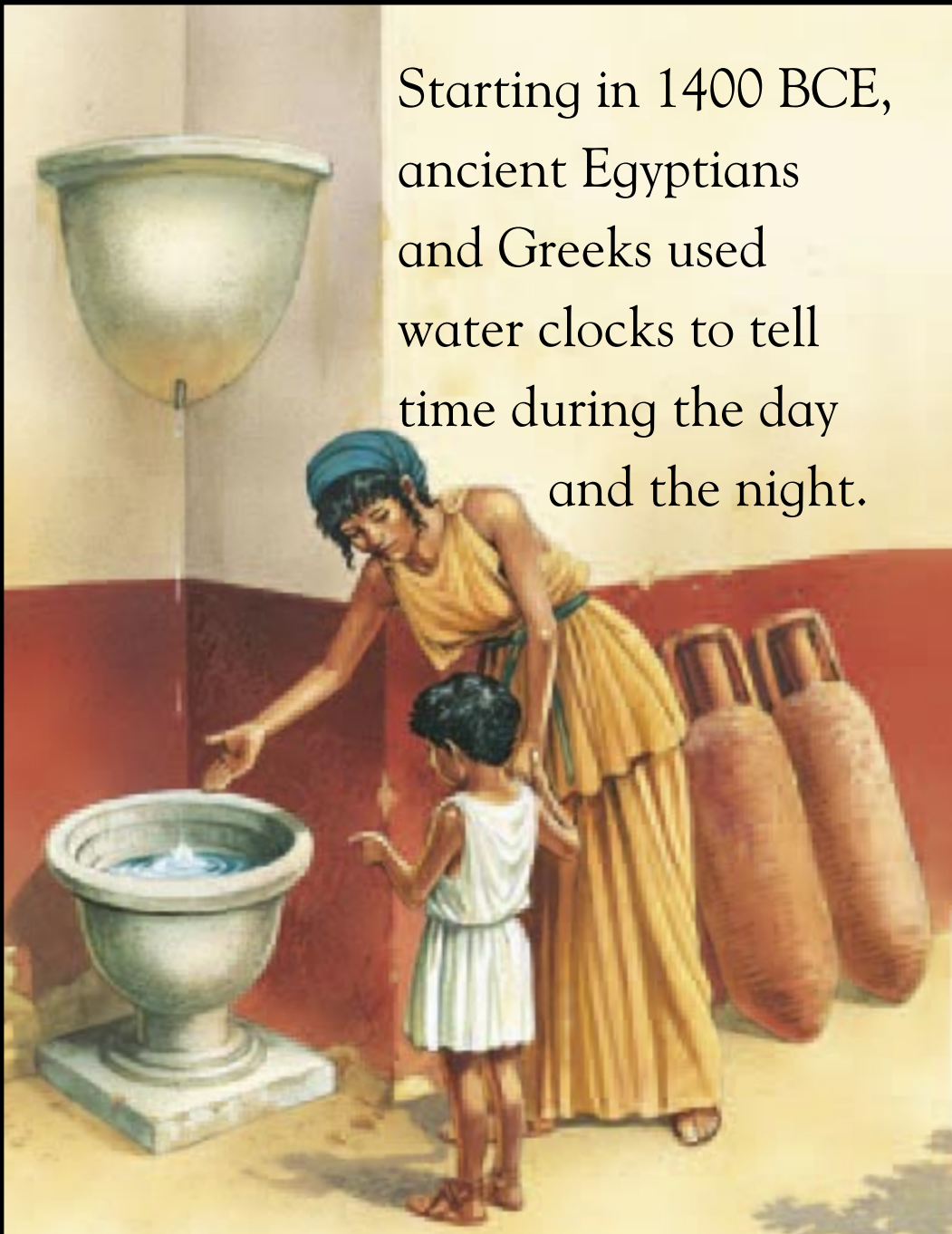
People could not tell what time
it was on cloudy days or at night.

Time for bed, Tut!

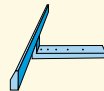
Around 600 BCE,
Egyptians lined up
merkhets [MER-kets]
with the stars to tell
the time at night.



Starting in 1400 BCE,
ancient Egyptians
and Greeks used
water clocks to tell
time during the day
and the night.



Timeline



Prehistoric times 3500 BCE 1500 BCE 1400 BCE

Water-clock tower

In 1088, Su Sung, a Chinese monk, built an amazing water-clock tower. It was more than 30 feet (9 m) tall and had many moving parts.

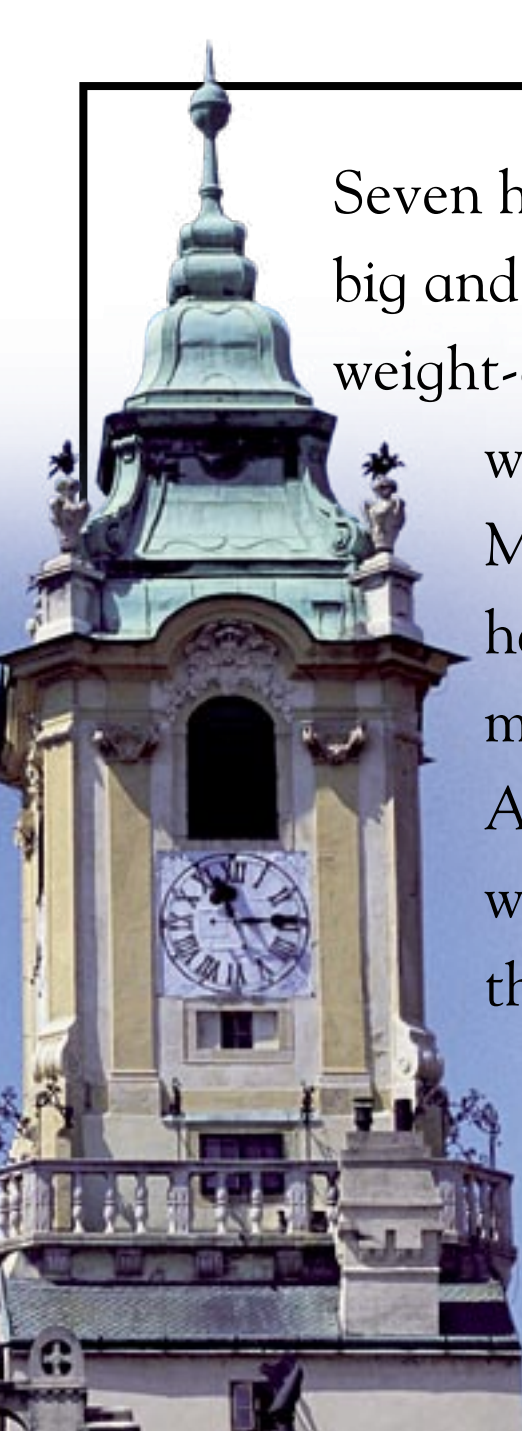


Water was poured into a bowl with holes in it. As the water dripped out through the holes, people checked the water levels using special marks. This told them how much time had passed.



Water-level marks

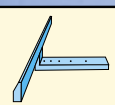




Seven hundred years ago,
big and heavy
weight-driven clocks
were invented.
Many of these clocks
had round faces and
moving hands.
After the weights
were raised up,
they would lower
slowly to make
the clocks work.

*Bells on this clock tower
rang on the hour.*

Timeline



Prehistoric times 3500 BCE 1500 BCE 1400 BCE 1300

*The outside
and inside of
a pocket
watch*



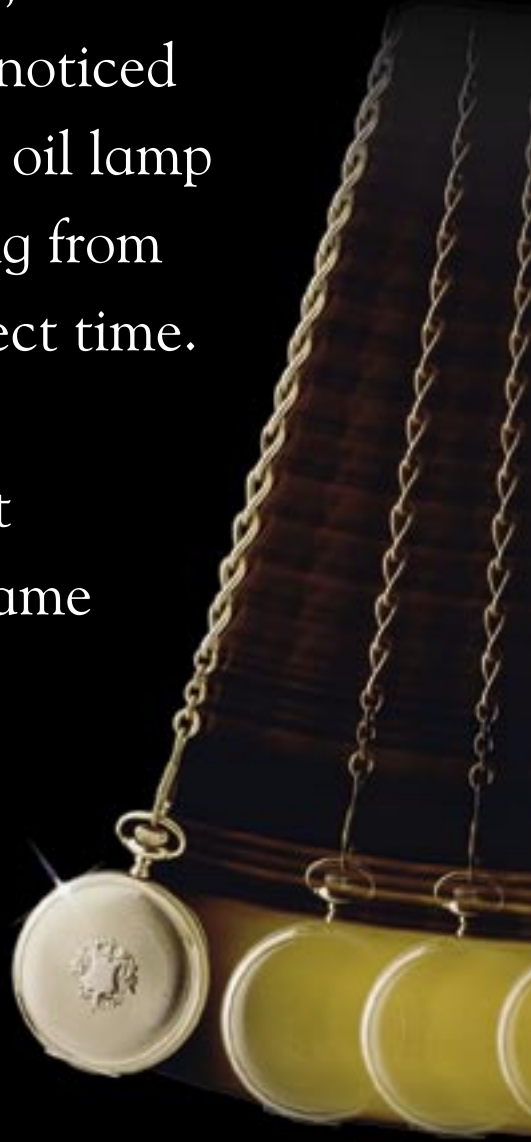
Two hundred years later, clocks were made that were powered by springs instead of weights. They were small and light, and some were made to fit in pockets. These tiny timepieces were the first pocket watches.



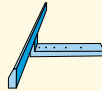
1500



In 1582, Galileo Galilei noticed that an oil lamp swinging from a chain kept perfect time. He found that a swinging weight always took the same number of beats to go backward and forward.



Timeline



Prehistoric times 3500 BCE 1500 BCE 1400 BCE 1300

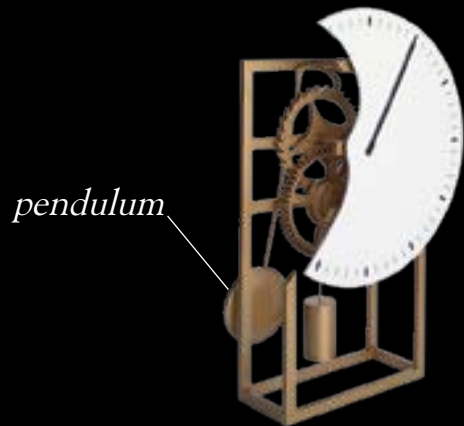
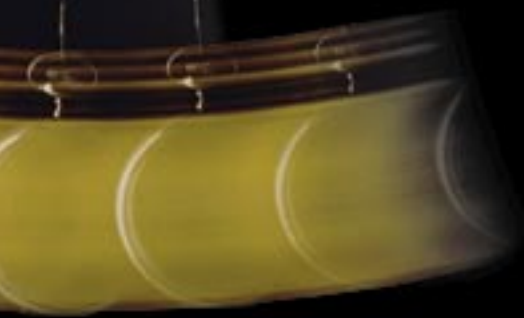
The cuckoo clock

This pendulum clock makes a whistle that sounds like a cuckoo bird every hour. If it is 12 o'clock, it whistles 12 times!



Another name for a swinging weight is a pendulum.

In 1657, Christiaan Huygens invented a clock that used a pendulum to keep time.



1500



1657

On the high seas, sailors needed to know the exact time to find their way.

Pendulum clocks needed to stand still and would not work on choppy waters.

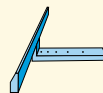


Sands of time

Sometimes, sailors used hourglasses filled with sand or powdered eggshells to tell time. The powder would take one hour to flow from the top bulb to the bottom bulb.



Timeline



Prehistoric times 3500 BCE 1500 BCE 1400 BCE 1300



John Harrison

H4 chronometer

In 1759, John Harrison invented the H4 chronometer, a special clock to use on ships.

It worked so well that it won a prize from the British government.



1500



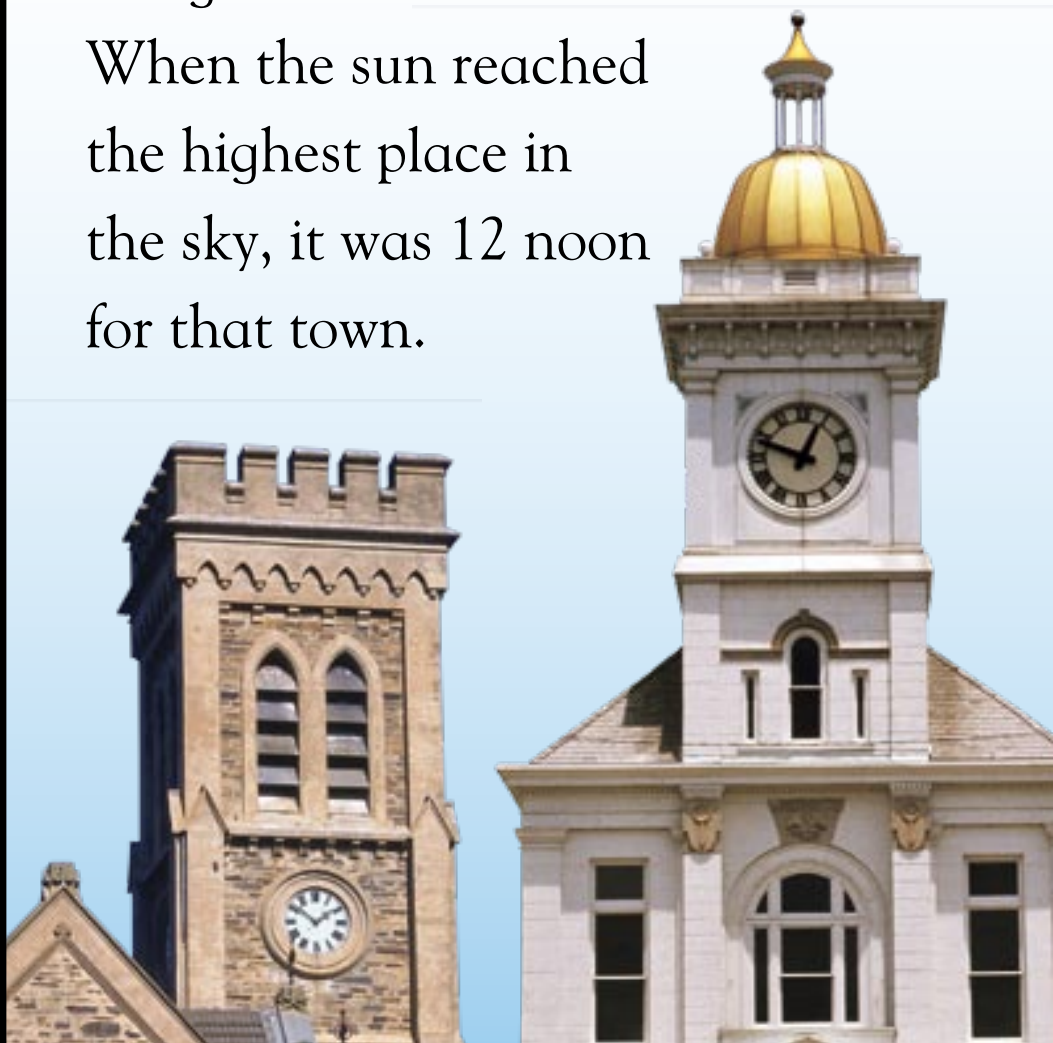
1657



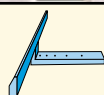
1759

Clocks had problems on land, too.
Each town set its clocks
using the sun.

When the sun reached
the highest place in
the sky, it was 12 noon
for that town.



Timeline



Prehistoric times 3500 BCE 1500 BCE 1400 BCE 1300

Since the sun reaches the highest place in the sky at different times in different places, every town had its own 12 noon!

Time was different all over the place.

It was a mess!



1500



1657



1759

Many people thought it was silly for every town to have its own time. They asked questions like:

“How can railroads and mail coaches run on time?”

“How can people meet for lunch or do business?”

“How can we fix this problem?”

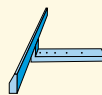
Sandford Fleming, a railroad worker, knew the answer.

Greenwich Mean Time

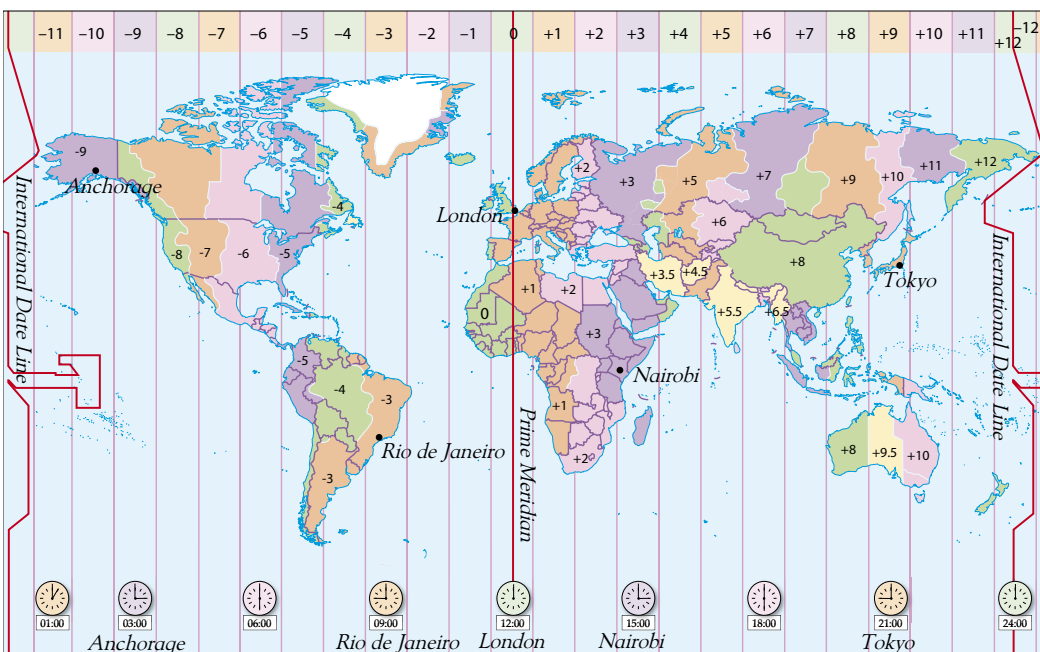
Greenwich Mean Time (GMT) is the time in Greenwich, England. Each time zone was described by how many hours away from GMT it was.



Timeline



Prehistoric times 3500 BCE 1500 BCE 1400 BCE 1300

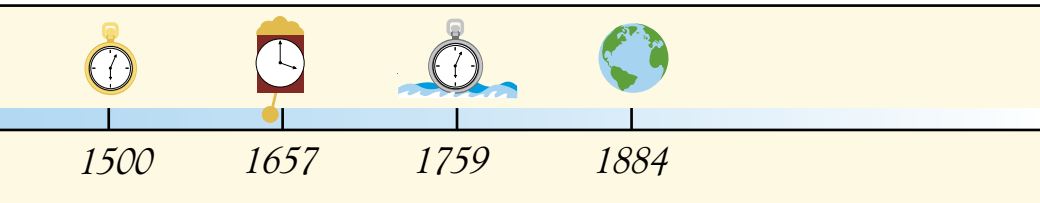


A map of the world's time zones

His idea was to divide the world into 24 time zones.

Each zone was exactly one hour apart from its neighbors.

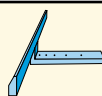
Now, time was the same for everyone in each zone.





In the 1880s, women were the first to wear wristwatches. After soldiers wore them in World War I, men liked to wear them as well.

Timeline



Prehistoric times 3500 BCE 1500 BCE 1400 BCE 1300

Later, watches with tiny quartz crystals inside would become the best timekeepers.



The crystals moved like pendulums, but kept even better time.

Quartz watches are still popular today.



Digital quartz watches

In 1972, quartz watches went digital. A display of numbers appeared instead of a clock face.



1500



1657



1759

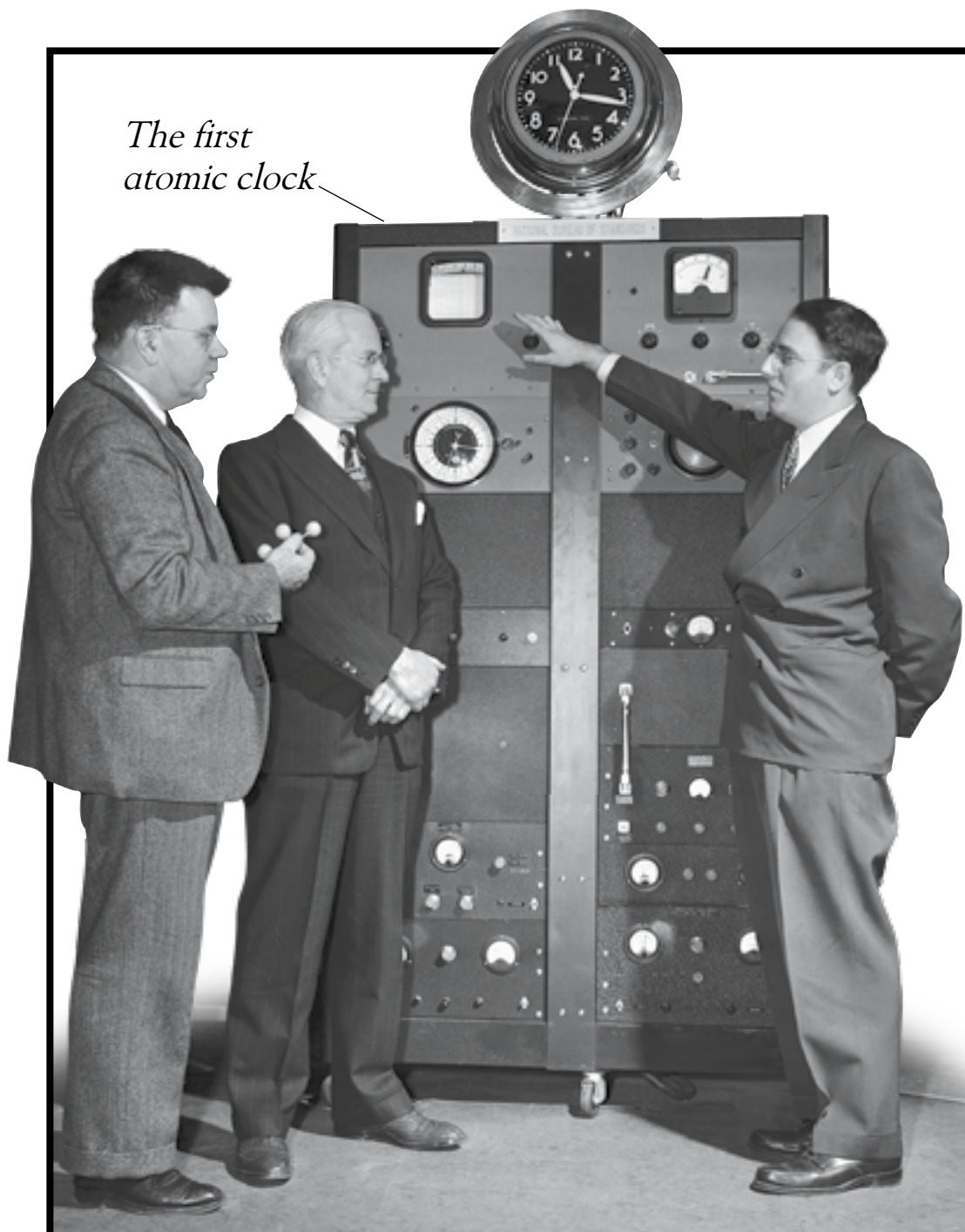


1884

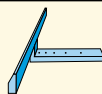


1885

*The first
atomic clock*



Timeline



Prehistoric times 3500 BCE 1500 BCE 1400 BCE 1300

Quartz watches no longer keep the most exact time.

What does?

Atomic clocks do!

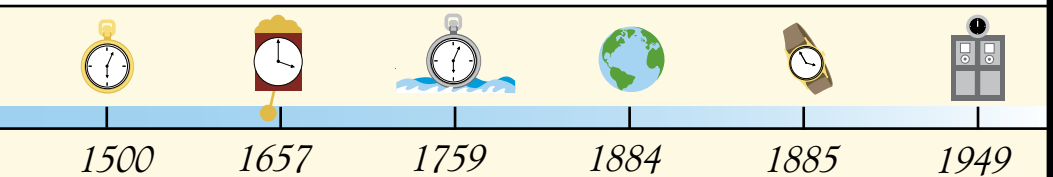
Atomic clocks use atoms—tiny particles, too small for us to see—to help tell time.

The atoms act like pendulums.

They move backward and forward billions of times per second.

This lets atomic clocks tell time to a billionth of a second.

Modern atomic wristwatch



Exact timekeeping

In 1999, scientists invented the world's most exact clock. It is called NIST-F1. It will not gain or lose a second in millions of years.



*Space
travel*

So, why do we need to tell time to a billionth of a second?



Satellites



Radio and television broadcasts

Many forms of technology that we use today need the split-second time of an atomic clock to work.

These pages show just a few examples.



Cell phones

Today, clocks
come in all
shapes, sizes,
colors, and
styles.

Some flash,
make sounds,
play music,
or say
the time
out loud.

Others time
how fast
you run.



A large red bicycle wheel is the central focus, with a yellow bell attached to its top. Inside the wheel's frame, several timepieces are arranged: a silver alarm clock, a circular inset showing a classical building with a dome, a green-rimmed analog clock, and a circular inset showing a hand holding a blue digital stopwatch. The background is white.

These timepieces
are very different
from the early
sundials,
obelisks, and
water clocks.
But one thing
is the same.
They help us
plan our day,
so that we
can be sure
to always be
on time!



Timely facts

Long-case clocks were built to hide their long pendulums. The song “Grandfather’s Clock” written in 1876, inspired people to call them grandfather clocks.

The ancient Egyptians were the first people to divide the hour into 60 parts, or minutes. Their number system was based on the number 60, which is easy to divide by 2, 3, 4, 5, and 10.



The world’s smallest clock is an atomic clock the size of a grain of rice created by the National Institute for Standards and Technology in Boulder, Colorado, in 2004.

The Colgate Palmolive clock is one of the world’s biggest clocks. It measures 55 feet (16.8 m) around! It is located in Jersey City, New Jersey. It was built in 1924.



READERS

Level 2

Dinosaur Dinners
Bugs! Bugs! Bugs!
Slinky, Scaly Snakes!
Animal Hospital
The Little Ballerina
Munching, Crunching, Sniffing, and
Snooping
The Secret Life of Trees
Winking, Blinking, Wiggling,
and Wagging
Astronaut: Living in Space
Twisters!
Holiday! Celebration Days around the
World
The Story of Pocahontas
Horse Show
Survivors: The Night the
Titanic Sank
Eruption! The Story of Volcanoes
The Story of Columbus
Journey of a Humpback Whale
Amazing Buildings
Feathers, Flippers, and Feet

Outback Adventure: Australian
Vacation
Sniffles, Sneezes, Hiccups,
and Coughs
Starry Sky
Earth Smart: How to Take Care
of the Environment
Water Everywhere
Telling Time
Ice Skating Stars
Let's Go Riding!
I Want to Be a Gymnast
LEGO: Castle Under Attack
LEGO: Rocket Rescue
Star Wars: Journey Through Space
MLB: A Batboy's Day
MLB: Let's Go to the Ballpark!
iInsectos! en español
iBomberos! en español
La Historia de Pocahontas
en español
Meet the X-Men
Spider-Man: Worst Enemies

Level 3

Spacebusters: The Race
to the Moon
Beastly Tales
Shark Attack!
Titanic
Invaders from Outer Space
Movie Magic
Plants Bite Back!
Time Traveler
Bermuda Triangle
Tiger Tales
Aladdin
Heidi
Zeppelin: The Age of the Airship
Spies
Terror on the Amazon
Disasters at Sea
The Story of Anne Frank
Abraham Lincoln: Lawyer, Leader,
Legend
George Washington: Soldier, Hero,
President
Extreme Sports

Spiders' Secrets
The Big Dinosaur Dig
Space Heroes: Amazing Astronauts
The Story of Chocolate
School Days Around the World
LEGO: Mission to the Arctic
NFL: Super Bowl Heroes
NFL: Peyton Manning
NFL: Whiz Kid Quarterbacks
MLB: Home Run Heroes: Big Mac,
Sammy, and Junior
MLB: Roberto Clemente
MLB: Roberto Clemente
en español
MLB: World Series Heroes
MLB: Record Breakers
MLB: Down to the Wire: Baseball's
Great Pennant Races
Star Wars: Star Pilot
The X-Men School
Abraham Lincoln: Abogado, Líder,
Leyenda *en español*
Al Espacio: La Carrera a la Luna *en español*

Index

- | | | |
|--|---------------------------|----------------------------|
| ancient Egyptians
8, 10, 11, 12, 32 | Greenwich Mean
Time 22 | pocket watches 15 |
| ancient Greeks 12 | H4 chronometer 19 | quartz crystals 25 |
| atomic clock 26,
27, 29, 32 | Harrison, John 19 | springs 15 |
| Colgate Palmolive
clock 32 | hourglasses 18 | stars 7 |
| cuckoo clock 17 | Huygens,
Christiaan 17 | sun 7 |
| digital quartz
watches 25, 27 | merkhets 11 | sundials 9, 10, 11,
31 |
| Fleming, Sandford
22 | moon 7 | Sung, Su 13 |
| Galilei, Galileo 16 | NIST-F1 28 | time zone 22, 23 |
| gnomons 8 | obelisks 8, 9, 31 | water clocks 12, 13,
31 |
| grandfather clocks
32 | pendulum 17, 25,
27 | weight-driven
clocks 14 |
| | pendulum clocks
17, 18 | weights 14, 15, 16,
17 |
| | | wristwatches 24 |

 **READERS**

My name is

I have read this book



Date